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Stabulation (lees stirring) in grape must as a method for aroma intensification: A comparison with skin contact and a classical version of Traminer and Sauvignon blanc in Austria

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1. INTRODUCTION

The quality of Austrian wines is highly respected internationally. Apart from the flagship varieties of white wine Grüner Veltliner and red wine Blaufränkisch, Austria is also known for its great diversity. Among the aroma varieties, Sauvignon blanc plays a very important role, especially in the wine-growing region of Styria, while the Traminer variety is a local player in the Klöch area (Vulkanland Styria), but is found in almost all wine-growing regions of Austria.

A wish from the winemakers are methods to intensify the Sauvignon blanc and Traminer aroma and to increase the aromatypicity of the wines. While the aroma of Sauvignon blanc is mainly characterized by thiols and methoxypyrazines [1], free monoterpenes, especially cis-rose oxide, are important for Traminer wines [2]. Stabulation in the grape must is a possible step in white wine production, in which the existing lees are stirred up before sedimentation. This usually takes place under cool conditions, for example at +2°C. The lees are then stirred up for up to seven days. The lees are kept in continuous suspended conditions. In oenological practice, a stirrer connected to the tank is usually used and agitated several times a day. The theoretical effect of lees stirring is that more aroma substances and aroma precursors are extracted from the lees particles into the must. In New Zealand, this method is used for varieties such as Sauvignon Blanc. Stabulation has also become established in Styria in some wineries. However, little is known about the real effect on varietal aromas of Sauvignon blanc and Traminer.

Otherwise, there is a risk to get reductive off-flavors into the wine. Furthermore the must could oxidize. A cool must can bring significantly more oxygen into solution than a must at room temperature [3]. A problem could also be the heating of the must after lees stirring. After stabilization, the must should first be clarified and then warmed up to 16°C in order to be able to start fermentation optimally. Possibly, other yeasts, such as those of the genus Hanseniaspora, could already start fermenting the must before the addition of starters. Undesirable off-flavors could be the result. Clearly, other microorganisms, such as acetic acid bacteria, could also become a problem. Little is known about all this negative effects [4].

The aim of the present study is to compare skin contact with different variants of stabilization and classic variants for the Sauvignon blanc and Traminer varieties. On the one hand, the aroma profiles of the musts and wines and, on the other hand, the phenolic content are to be examined in the trial wines. These wines will also be characterized sensory.

2. MATERIALS AND METHODS

2.1. Samples

The grapes were obtained from the experimental vineyards of Federal Research Institute for Oenology and Pomology in Klosterneuburg, Austria. The 1200 kg Sauvignon blanc grapes were harvested on September 11, 2019 at 18 °Babo (20.6 °Brix, 11.43 %vol) and 6.0 g/l acid b.a. tartaric acid in 25 kg harvest boxes. The 1500 kg of Traminer were harvested at 18.6 °Babo (21.3 °Brix, 11.85 % vol) and 5.1 g/l acid b.a. tartaric acid on September 16, 2019, also in 25 kg boxes. The grapes were selected and free of rot, they were sulfured box by box with 60 mg SO2/kg of grapes and cooled down to 2°C overnight.

2.2. Experiments

The randominized and cooled grapes were divided for the different variants. Three- and seven-day lees stirring with 12 hours and 24 hours of maceration (skin contact) and a classic variant were compared. All experiments were performed in triplicate for both varieties. Both the maceration period and the lees stirring were carried out under chilled conditions in cold storage (2°C). Subsequently, the musts were clarified after addition of a pectolytic enzyme in a room at 18°C for 12 h. Clarification of the 0-variant and the maceration variants (pressing after 12 or 24 h maceration time) took place immediately after pressing and, in the case of the lees stirring variants, after the corresponding stirring period. One liter of the clarified musts were frozen for analyses and the rest fermented under standard conditions (18°C, Oenoferm Klosterneuburg, 25g/hl DAP), sulfured at 60 mg/L after fermentation, clarified after three weeks and sterile filled with 50 mg/L free SO2 after 10 weeks. Then stored at 2°C until sensory and chemical analysis.

2.3. Chemical analyses

The mosts were analyzed for basic parameters by FTIR [5] and for free monoterpenes by GC-MS [6]. Wines were analyzed for basic parameters by FTIR [5], for free monoterpenes by GC-MS [6], and for methoxypyrazines [7] and thiols by GC-TQMS [8]. All analyses were performed in duplicate.

2.4. Sensory analyses

A team of ten experts was invited to judge the wines. The evaluation consisted of unstructured scales. The unstructured line scale is a 10 cm long horizontal straight line which is judged ascending from left to right depending on the parameter. The tributes aroma typicity (from atypical to typical) abd aroma intensity (from little to very intense) were assessed.

2.5. Statistic

The statistical evaluation was performed with the SPSS 22.0 program, using the following methods for the analytical data: Dunnet T3 test, Tukey B test, and Kruskal-Wallis test and the LSD test. Crucial to the choice of test method was a test for normal distribution and variance homogeneity. Testing was performed at the significance level $p \leq 0.05$.

3. RESULTS

3.1. Results of the free monoterpenes

In the case of the Sauvignon Blanc and Traminer varieties, the free monoterpenes were analyzed in the must and in the wine, respectively. Figure 1 shows the results in the must for the Traminer variety as an example for all other results. The results are heterogeneous and cannot be fully discussed within this short publication.

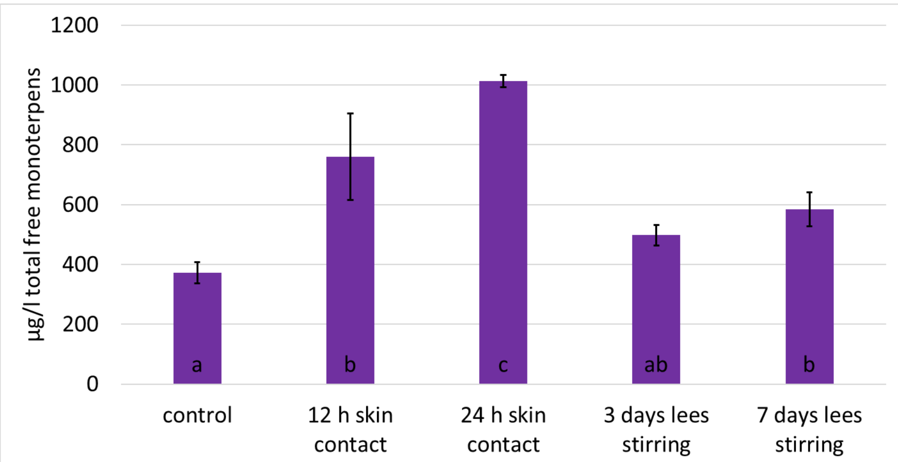

Figure 1. total free monoterpenes in Traminer most

The concentrations of the parameter "sum of free monoterpenes in the must" were in the range of 380 µg/L (0-variant) to 1000 µg/L (24 h mashstand) for the variants of the Traminer variety. The two skin contact variants basically achieved the highest values of free monoterpenes in the must. Particularly noteworthy here, is the 24 h maceration time variant. The 3-day lees stirring variant also led to an increase in this substance class concentration compared to the zero variant. The seven-day lees stirring compared to the three-day lees stirring resulted in an enrichment of the free monoterpenes. However, the concentrations of these substance classes in the two variants did not come close to the values of the two maceration time variants. Compared to the zero variant, however, both lees stirring variants led to an increase in free monoterpenes in the must.

3.2. Results of the thiol analysis

Thiol analyses were performed in the finished wines. As an example, the results of the Sauvignon blanc wines will be considered in the course of this publication. The concentrations of 3-mercaptohexyl acetate (3MHA) were not significantly different between the variants, while significant differences were found at 3-mercaptohexanol (3MH). Figure 2 shows the 3MH results. The 7-day lees stirred variant performed best, while the 3-day lees stirred and controll variant showed the lowest concentrations. An increase in the concentration of 3MH was also obtained with the skin contact (24h and 48h) compared to the control.

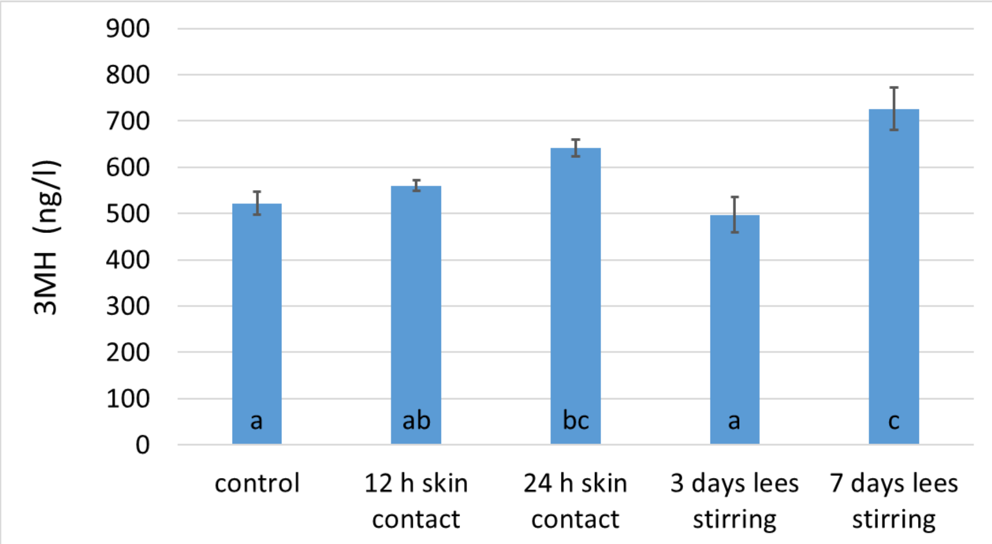

Figure 2. 3MH concentration in Sauvignon blanc wines

3.3. Results of the methoxypyrazine analysis

Methoxypyrazine analyses were performed in the finished wines. As an example, the results of the Sauvignon blanc wines will be considered in the course of this publication. Figure 3 shows the 2-isobutyl-3-methoxypyrazine (IBMP) results. The 24-hour skin contact performed best, while the 7-day lees stirring did not show significant differences from all variants due to its wide variance within replicates.

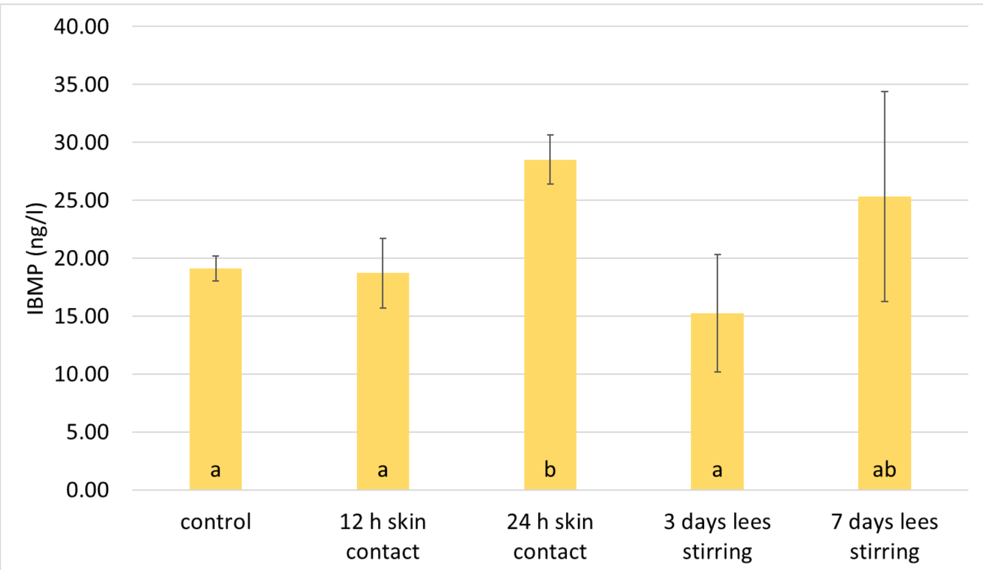

Figure 3. IBMP concentration in Sauvignon blanc wines

3.5. Results of sensory analysis

The results of the sensory tests show that, across the two varieties, the aroma intensity is highest at 24 h maceration and 7 t maceration, while the aroma typicity of the Sauvignon blanc wine was judged highest in the control sample, it was the 7-day lees stirring and 12 h skin contact variants that performed highest in the aroma typicity in the Traminer wines. Figure 4-5 shows the results.

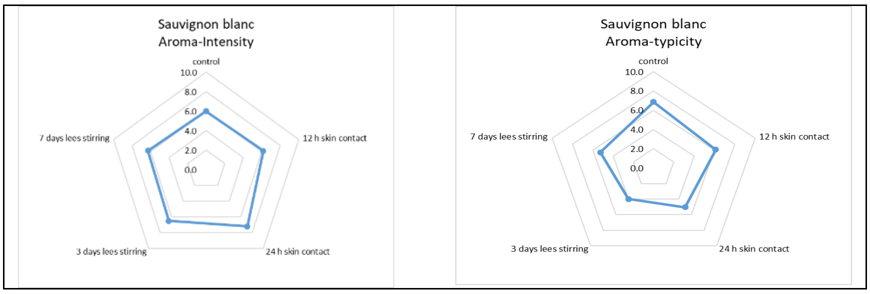

Figure 4. results of the sensory study of Sauvignon blanc wines

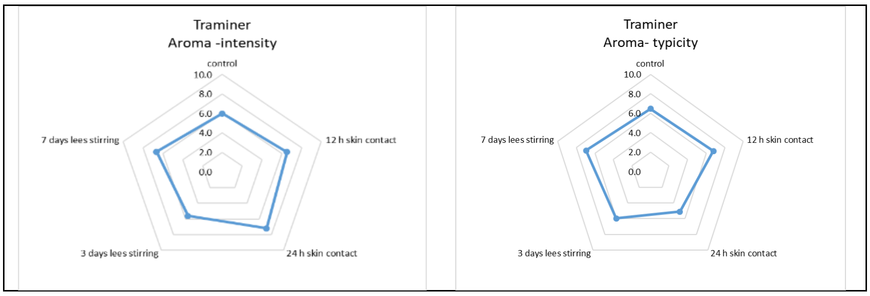

Figure 5. results of the sensory study of Traminer wines

Conclusion

From a strictly analytical point of view, the lees stirring only produced good results to a limited extent compared to the skin contact. However, some effects were observed in comparison with the control sample. The 3-mercaptohexanol concentrations were significantly increased with 7 days of lees stirring compared to the other variants (except 24 h mash standing time). It was also positive that the lees stirring showed effects with regard to the content of free monoterpenes compared to the control in the Traminer variety.

Considering also the sensory results, it becomes apparent that the interpretation of the analytical results as presented here might lead to a wrong conclusion. It has been clearly shown that an intensification of the aroma does not necessarily lead to an improvement of the aromatypicity. In both Traminer and Sauvignon blanc, aroma intensity was highest in the 24 h skin contact variants (correlates broadly with the analytical results), but in neither variety was aromatypicity also highest in these wines. A differentiated consideration of individual compounds (free monoterpens, esters…), but also in particular the consideration of wine defects (reductive notes), would be necessary for a final assessment and could not be fully answered in the context of the present study.

References.

1. J. Marais, SAJEV 15(2) (1994) 41-45.
2. H. Dietrich, H. Otteneder, R. Wiikowski (eds.), Analytik des Weines, Stuttgart, Germany, 2019
3. R. Steidl, Kellerwirtschaft, Wien, Austria, 2019
4. R. Eder, Weinfehler, Wien, Austria, 2003
4. International Organization of Vine and Wine 2010: OIV/OENO Resolution 390/2010
5. C. Philipp, H. Schödl, S. Sari, K. Korntheuer, E. Patzl-Fischerleitner, H. Scheiblhofer and R. Eder. Mitt. Klosterneuburg, 69 (2019) 258-279.
6. C. Philipp, P. Eder, S. Sari, N. Hussain, E. Patzl-Fischerleitner, H. Scheiblhofer and R. Eder. Molecules, 25 (23) (2020) 5705.
7. C. Philipp, P. Eder, B. Walter and R. Eder. to be published